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GEOLOGY

An Event-Based Depositional Model for the Paleocene–Eocene Sandy–Clayey–Siliceous Sequence of the Russian Platform

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Abstract—An event-based depositional model for the Paleocene—Eocene sandy—clayey—siliceous deposits of the Russian Platform was proposed. The model was based on pulsational input of pyroclastic material and intrusion of sandy injectites. These processes should be taken into account to identify the stratigraphic position of the Paleocene—Eocene lithostratigraphic units in the eastern, southeastern, and southern parts of the Russian Platform.

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The dating of the Paleocene–Eocene facial varieties in the eastern, southeastern, and southern parts of the Russian Platform has remained relevant for many years. The pattern of occurrence of the formations appears to be more complicated than the stratigraphic sequence used by most researchers, because of the age-related shift of the bottom surface of the formation (Fig. 1).

What are the reasons for the complex structure of the Paleogene sequence and why does the traditional sedimentary succession of lithostratigraphic units not illustrate the real pattern of their relationship?

In our opinion, these issues have to be considered in the light of the genetic futures of the Paleocene facies taking into account not only marine sedimentation, which is recognized by all researchers, but also other factors, namely the input of pyroclastic material into the sedimentary basin [7, 13] and the intrusion of sandy injectites into the siliceous formation [14].

The Paleogene volcanic ashes of the southeastern part of the Russian Platform have been fixed by many authors [4, 5, 8, 9, 15], etc.

It is known that "camouflaged" pyroclastic material is volcanic ash transformed into more stable mineral components [5]. Pyroclastic material was found in the Danian–Selandian siliceous rocks of the Nizhnesyzranskaya formation at the Kamennoyarskoe deposit (Astrakhan region) [13], in the Lutetian–Bartonian smectite-bearing clays of Kiev Formation at the Ivanovskoye deposit (Volgograd region) [15] and Tarasovskoye deposit (Rostov region) [13], and in the Middle Eocene claystonelike layers in sands of the Buchak Formation of the Tarasovskoe deposit (Fig. 1). A characteristic feature of the "camouflaged" pyroclastics was revealed in the sequences listed above. This is paragenesis of authigenic minerals, such as opal–cristobalite–trydymite, smectite, clinoptilolite, and glauconite in association with half dissolved debris of the volcanic glass from which these minerals were transformed ([5, 7, 8], etc.).

Active explosions of the Caucasus Minor Volcanic Arc [3], where dacite and andesite-dacite tuffs up to 2000 m thick were formed, could be the Paleocene–Eocene sources of pyroclastic material. Effusion of volcanites was most likely accompanied by outbursts of acid (light) ash, which was transferred by the stratospheric air fluxes onto the Russian Platform.

Two large stratigraphic intervals (Fig. 1)—Paleocene (Danian–Thanetian) and Middle Eocene (Lutenian–Bartonian)—are distinguished on the basis of the distribution of pyroclastic material and the mineral composition of the rocks that were formed in the process of transformation of pyroclastics. Input of ash material in the Danian–Thanetian and its further transformation into more stable mineral components facilitated the formation of zeolite-containing siliceous deposits and diatomite [7]. Zeolite and bentonite-bearing clays of the Kiev Formation and the chronostratigraphic analogues were accumulated owing to Lutenian–Bartonian volcanic activity (Fig. 1).

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